# Hydronic (U.V. Solar) Heating Installation

**Joe Wilson, CEO**
**Bio-Response Solutions, Inc.**

BIO-RESPONSE SOLUTIONS

# June 21, 2013, Groundbreaking

# The building was to be:

- 14,250 square feet of manufacturing and office space in a steel building made in Indiana (Nucor)
- The first building in Indiana to be designed from the ground up for UV Solar Heat using technology proven at other Indiana institutions for heating water
- Heat delivery via hydronic (circulated water) tubes in the floor of the building, zoned for individual control in the occupied first floor offices
- Insulated to R-30 (walls and ceilings)
- With a concrete parking lot (not asphalt) for reduced heat load on the property in the summer

# Our Message

## The time is NOW for Energy Responsibility

# And this…

# LEED

**Are we taking this seriously?**

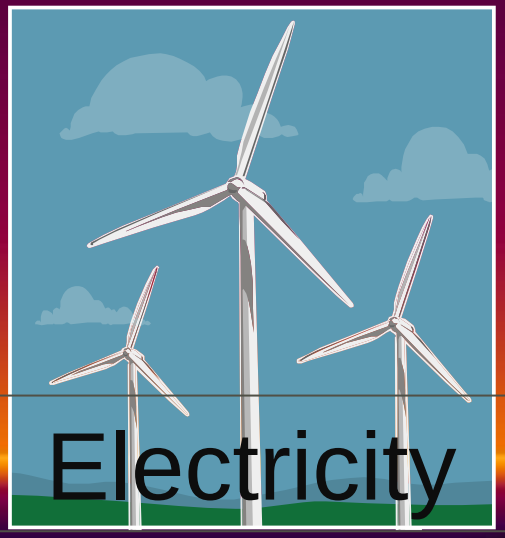
**If we don't then who will?**

# Energy alternatives prevent pollution!

**Solar Options**



**Wind**



Jack McMahan, Right, with the Sunquest 250 Solar Panel.  Solar America Solutions is an Indiana Company who are on the leading edge of Solar UV technology and performance


# U.V. Collection produces hot water:

The collection tubes consist of vacuum tubes over an energy absorbing surface that transmits heat into liquid filled copper tubes. The heat rises in these copper tubes to the collector at the top of the array. There are 25 tubes per array in 7’ x 7’ panels that weigh about 200 pounds each. These panels are sequentially plumbed in groups of 5 panels. Net system cost is less than $5,000 per panel.

Ross Correctional Facility, Chillicothe, Ohio are installing 400 panels to heat all of their facilities and their shower water

Wabash Correctional Facility in Indiana; 10 panels for hot water!

# Our Building in Danville

# We have 10 panels, 5 on each side of the roof

# Panels on the West side of the roof

# How Much Energy Can We Get?

From 15,000 to 30,000 BTU per hour per panel (cloudy v.s. sunny days)!

## PERFORMANCE UPDATE

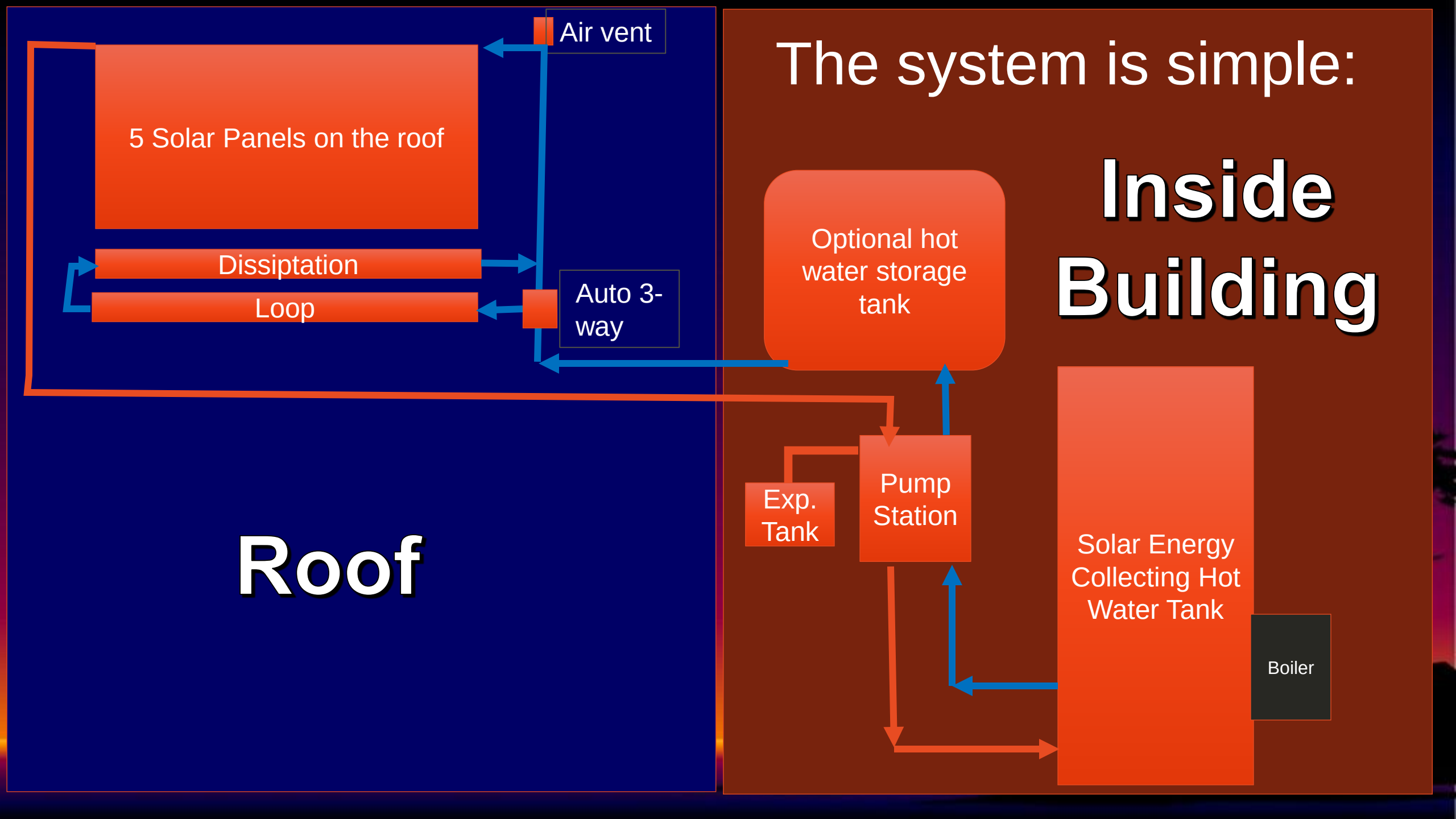
**Location:** Midwest Renewable Energy Association Training Center, Custer, WI
**Date / Time:** Wednesday, January 29, 2014 – 9:19AM, CST
**Weather:** Sunny
**Temperature:** -6° F
**Number of Collectors:** 5

| WATER TEMP OUT | – | WATER TEMP IN | = | TEMP RISE | FLOW RATE |
|---|---|---|---|---|---|
| 121° F | | 75° | | 46° | 7.2 GPM |

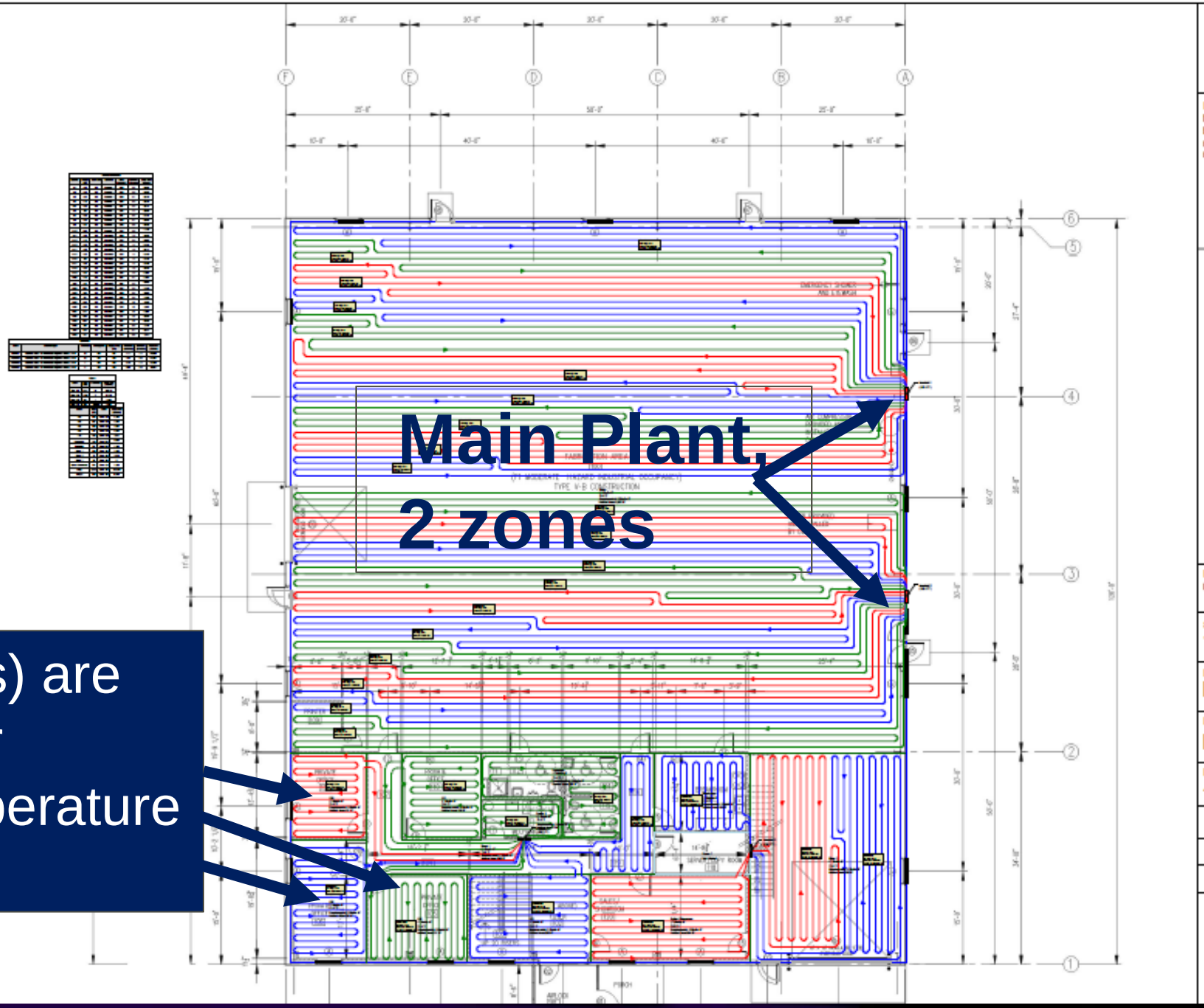
### BTU Computation

- 1 gallon of water weighs 8.35 lbs.
- 1 BTU is required to raise 1 lb. of water 1° F.
- 8.35 BTUs to raise 1 gallon of water 1° F.
- Flow rate x 8.35 x temp rise = BTU per minute x 60 = BTUs per hour ÷ 5 collectors = BTUs per hour, per collector.

**7.2 GPM (flow rate) x 8.35 BTUs x 46° (temp rise) = 2,765.52 BTUs per minute**
**2,765.52 BTUs per minute x 60 = 165,931.2 BTUs per hour**
**165,931.2 BTUs per hour ÷ 5 collectors = *33,186.24 BTUs per panel per hour**


Air vent
5 Solar Panels on the roof
Dissiptation
Loop
Auto 3-way
Roof
The system is simple:
Optional hot water storage tank
Inside Building
Exp. Tank
Pump Station
Solar Energy Collecting Hot Water Tank
Boiler

# Hydronic Heat Transfer Tubing layout (PEX Tubing)




Offices (or labs) are each zoned for individual temperature control

viega

DISCLAIMER:
Note: Details of the tubing bend radius have been simplified for clarity. Consult tubing manufacturer for specific bend radius recommendations.

PROJECT: Indoor Comfort - BioResponse Project

CUSTOMER:

PROJECT NO.: Indoor Comfort - BioResponse Project

SCALE: 1/8"=1'

DRAWING NAME: P1 (Ground Floor)

DRAWN BY: Michael Norgan

DATE: 4/24/2013

REVISIONS

| No | Desc | Date |
|---|---|---|
| | | |

# Pex tubing and Creatherm underlayment in place

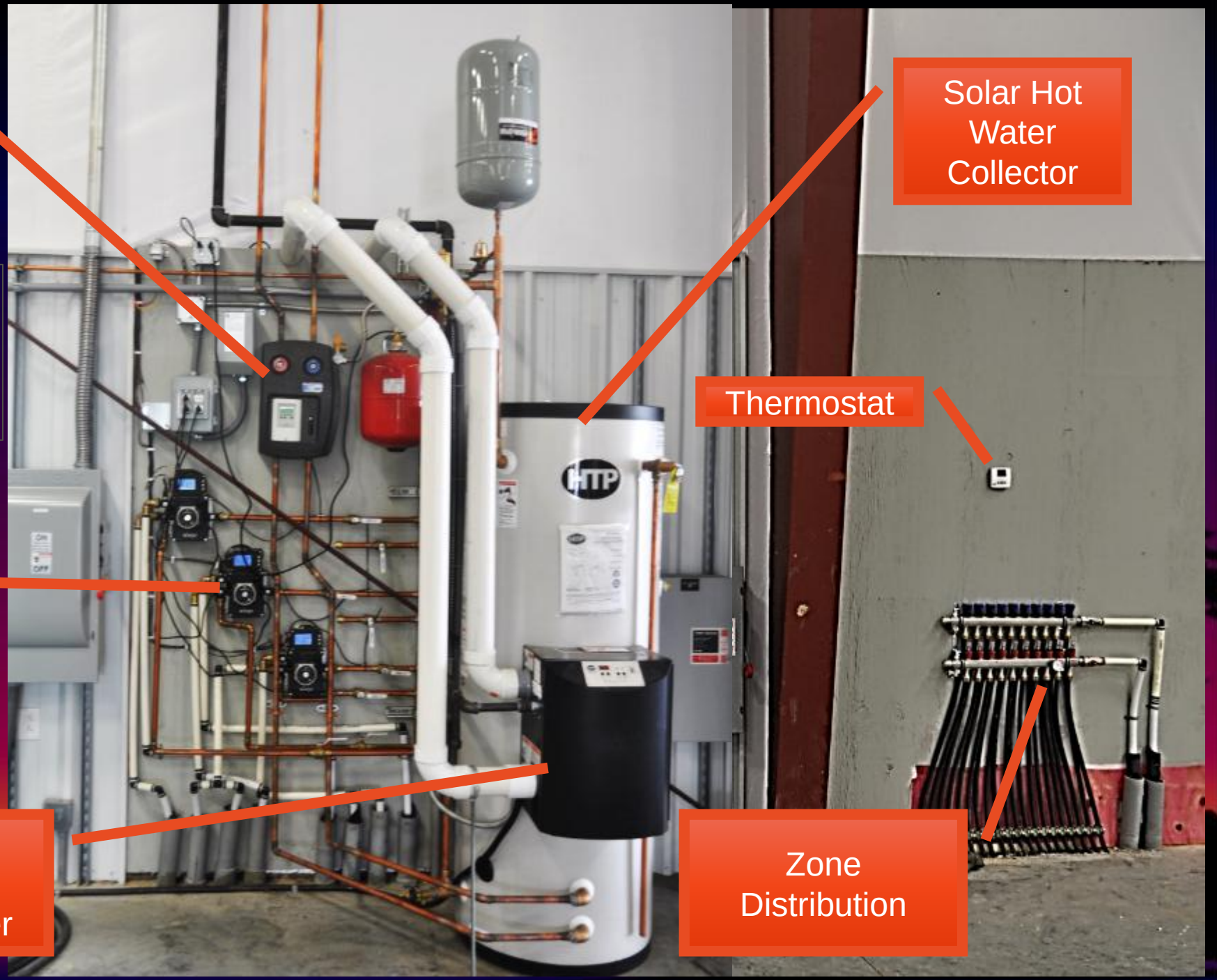
**1 million pounds of concrete, A huge heat sink to keep things warm at night!**

Solar pump

The mixing valves will mix the correct ratio of hot and return water to send through the floor to maintain the proper temperature

Mixing Valves and Pumps

Staged Condensing back-up boiler



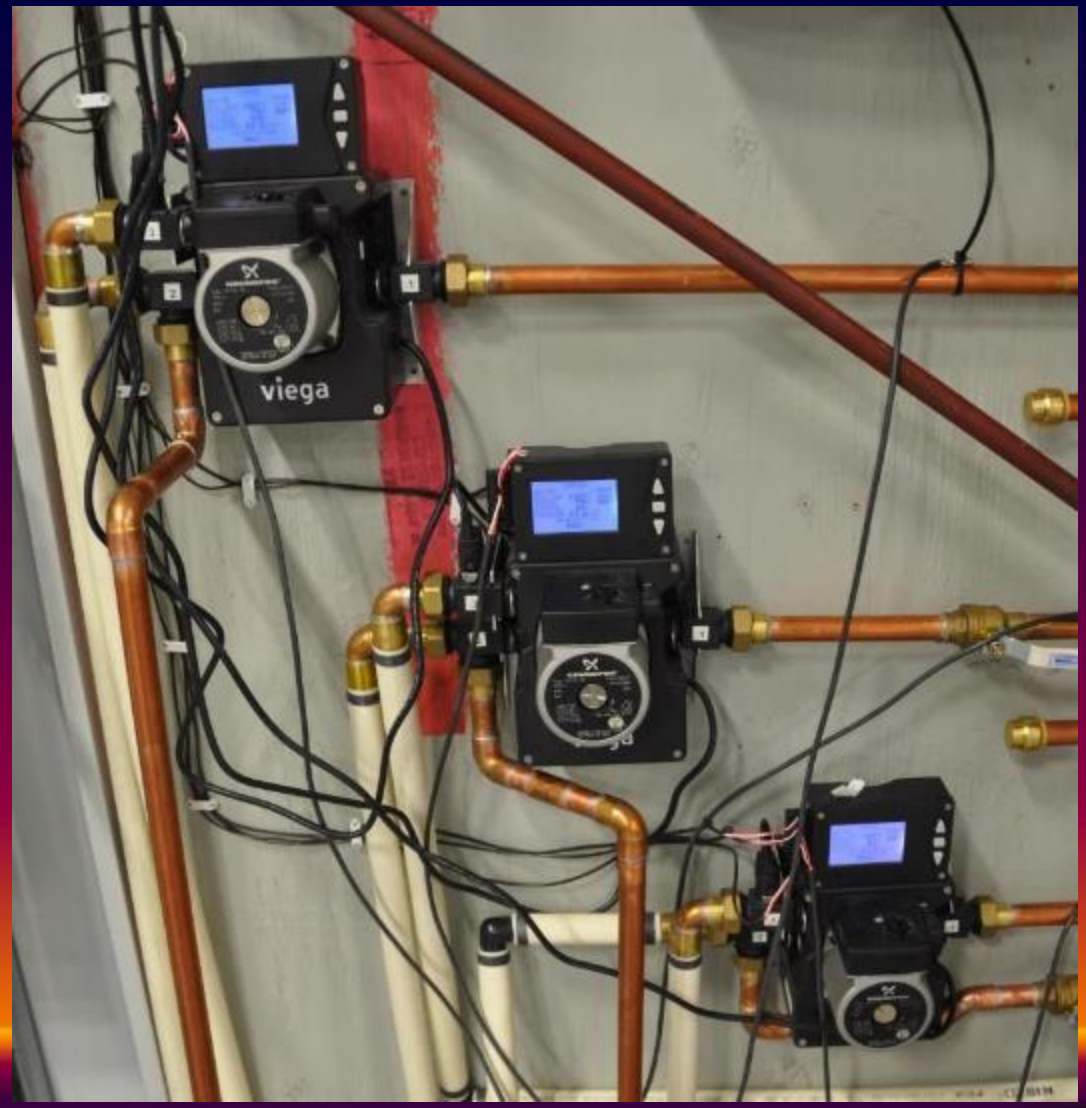

Solar Hot Water Collector

Thermostat

Zone Distribution

We keep the condensing boiler at 95 degrees F during the winter to keep the building up to 65 degrees at night

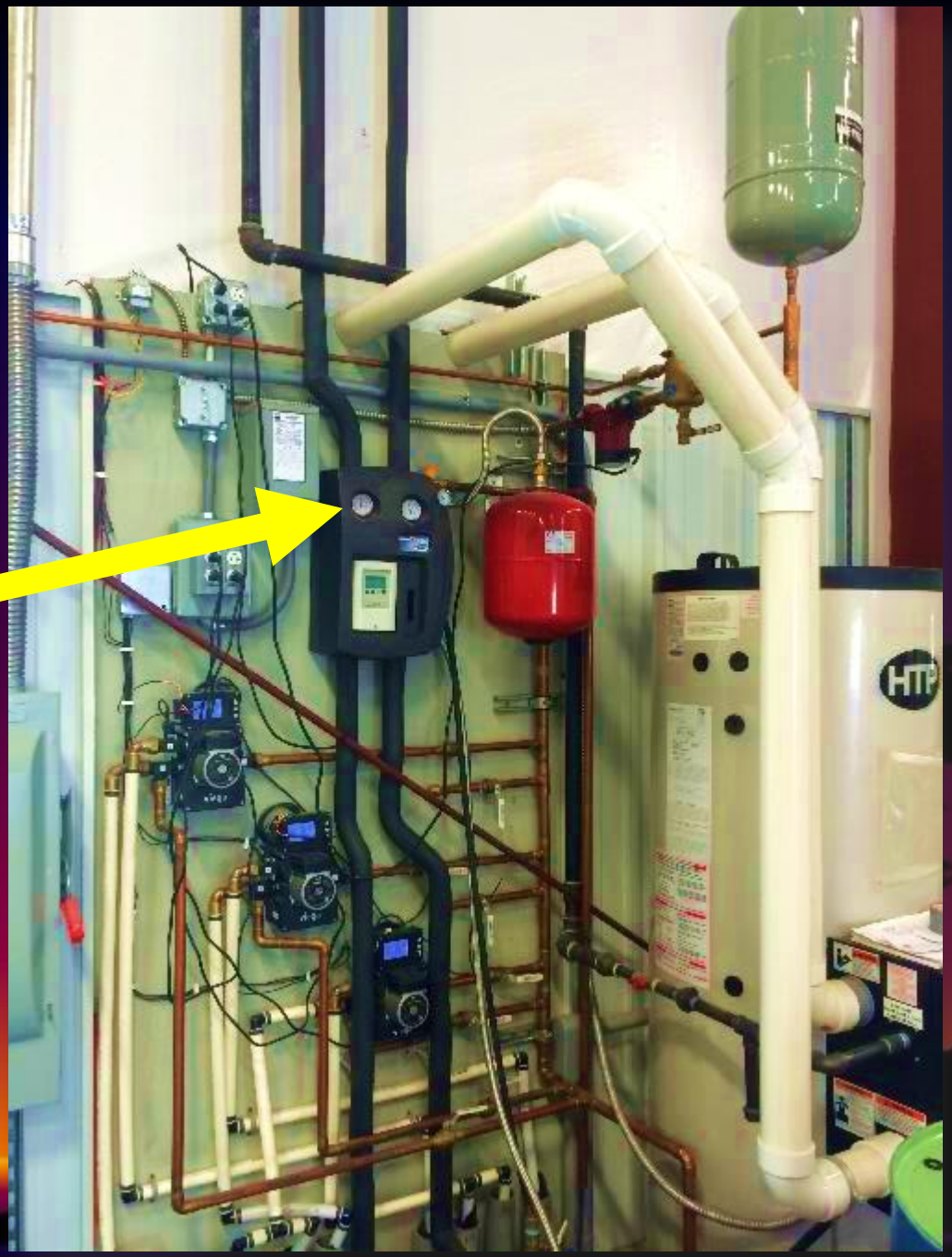
# Mixing valves do the work





# Zone Control


# Hazy Day, 170 degrees coming from the panels!

# Financials:

- $120,000 cost all in
  - Materials $75,000
  - Equipment install in building $25,000
  - Final plumbing and roof install on building $20,000
- 30% government tax credit on heat delivery system, we believe we can include insulation and concrete ($180,000 total) as part of the heat delivery system, so possible $36,000 to $54,000 tax credit, **to be conservative we will assume $40,000**
- $40,000 equipment deduct (other heating apparatus not needed)
- $40,000 tax credit deduct
- Net cost, $40,000

# Amortization:

- $40,000 net expenditure to recover
- Hydronic radiant (floor) heating is 40% more efficient than heating the air, so assuming this multiplier:
  - $5,000 per year gas bill with conventional heating
  - -$1,500 per year efficiency gain due to hydronic radiant heating = $15,000 saved in 10 years if gas remains priced the same.
  - $2,500 per year replaced by solar heat = $25,000 in 10 years assuming gas remains priced the same
- Easily a 10 year payback, probably better than that but lets be conservative!

# Why we did it?

1. To be energy responsible; to exemplify how we need to think if we are to prolong our energy resources on the planet
2. To show our prospective clients that we “walk the walk” when talking about energy efficiency advantages offered by our product designs (some of our systems operate at only 5% of the net energy requirement of commonly specified competitive technologies)
3. Comfort of our employees; hydronic radiant floor heating has no comparable comfort equal
4. To save money over the long run; betting natural gas cost will rise substantially over the next 10 years!

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# Thank You for your attention!